EXPLORING THE HEALTHCARE COST IMPLICATIONS OF CANCER STAGE

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Background

There is a complex relationship between cancer stage and cost to the NHS in England. Here, we aim to explore the variation in modelled costs for selected cancers by stage at diagnosis and progression to metastatic disease.

Method

Macmillan commissioned Monitor Deloitte to build a model of current and future cancer costs in England. Data on incidence (in 1995–2012), staging (in 2012) and survival (generally diagnosis in 2005–2008) were combined. It was then used as a basis to forecast prospective cancer cohorts up to 2020. This poster primarily describes a single year of the forecast – people diagnosed in 2015 with 15 years of costs post diagnosis.

The cancer cohorts where modelled through cancer-specific 'archetypal' care pathways of probabilities and costs. The care pathways were initially defined using NICE, NHS clinical guidelines, clinical audits and academic literature review. They were then refined to reflect current practice with clinical experts from across the Macmillan network. The pathways represent semi-optimised care rather than capturing the full variety of real-world clinical practice.

The role of systemic anti-cancer therapy is a key element in the modelling. Monitor Deloitte determined prescription rates by triangulating clinician feedback against NHS clinical guidelines, Systemic Anti-Cancer Therapy (SACT) 'regimens-by-tumour-site' aggregate data, Cancer Drugs Fund guidance, clinical audits and prescription rates.

Each chemotherapy or biological therapy node was costed as a 'procurement' episode and the appropriate number of 'delivery' episodes. The analysis was done in early 2015, so more complete SACT data may now be available and the coverage of the Cancer Drugs Fund has changed.

The model aims to consider total NHS costs rather than cost to providers. So unit costs were primarily based on 2013/14 NHS reference costs for spells of care, British National Formulary tariffs, and NICE technology appraisals.

Some of the assumptions are highly uncertain due to the lack of data, rapidly evolving treatment landscape and – in some cases – vast variation in clinical practice throughout England. However, we believe the analysis creates a foundation to stimulate debate in this area.

Results

Figure 1 shows total spend over 15 years post diagnosis on people diagnosed in 2015. Spend in the graph is grouped by the stage the cancer was originally diagnosed. Costs comprise the whole pathway including any metastatic recurrence.

It is estimated that fewer than 20% of costs for breast cancer, melanoma of the skin and bladder cancer are for people diagnosed at stage 4. For colorectal, pancreas and lung cancer, more than 50% of costs are on people diagnosed at stage 4. For lung cancer, the high spend on stage 4 is probably driven by over half of diagnosis at stage 4 (53% in 2014).[1] And there are limited treatments available for late stage disease. By contrast, only about a quarter of people with colorectal cancer are diagnosed at stage 4[1] but, as demonstrated in figure 2, costs vary considerably by stage at diagnosis.

Figure 2 differs to figure 1 as it refers to the prevalence population in 2015 rather than people diagnosed in 2015. And if someone is diagnosed with stage 1 and progresses to metastatic disease their cost of care is split between the stage 1 and stage 4 bars. Figure 2 indicates that in 2015, systemic anti-cancer therapies (shown in pale green) were the main driver of the high cost of stage 4 treatments. Biologics account for 71% of systemic anti-cancer therapy cost for people at stage 4. In our model, about two-thirds of the biological therapies spend is on regimens including bevacizumab. The use of biological therapies is a critical and sensitive driver of cost. Since doing this work in the spring of 2015, there have been further restrictions on the use of biologics in the Cancer Drugs Fund. So there has probably been a dramatic decrease in stage 4 spending.

At the end of the bars in figure 1 you can see the absolute spend on the population diagnosed at stage 4. Absolute spend on people diagnosed with stage 4 prostate and breast cancer is fairly high. Prostate cancer has a high incidence, so the 21%[1] diagnosed in stage 4 results in more than 7,000 patients diagnosed at stage 4. This is higher than all cancers studied except colorectal and lung. This combined with a moderate spend for each person diagnosed with stage 4 prostate cancer results in a high absolute spend on prostate cancer diagnosed at stage 4. By contrast, few with breast cancer are diagnosed at stage 4 (6% in 2014[1]). However, the absolute spend on people diagnosed at stage 4 is high because breast cancer is common and spend for each person across all stages is high.

Figure 3 shows the impact of disease progression on cost. The first bar is the cost of care for people living with cancer at stages 1 to 3. The next bar is the same early-stage diagnosed patients after their progression to stage 4 disease. The final bar is the cost of care for those diagnosed at stage 4. Spend on early-stage breast cancer is much higher than spend on late-stage disease. This is mainly because 94%[1] of breast cancer patients are diagnosed at stages 1 to 3. However, disease progression can be important as these people can incur many of the costs associated with early and late-stage disease. For breast and bladder cancer, spend on people who develop a metastasis after living with stages 1 to 3 cancer is higher or equal to spend on those diagnosed at stage 4.

Figure 1

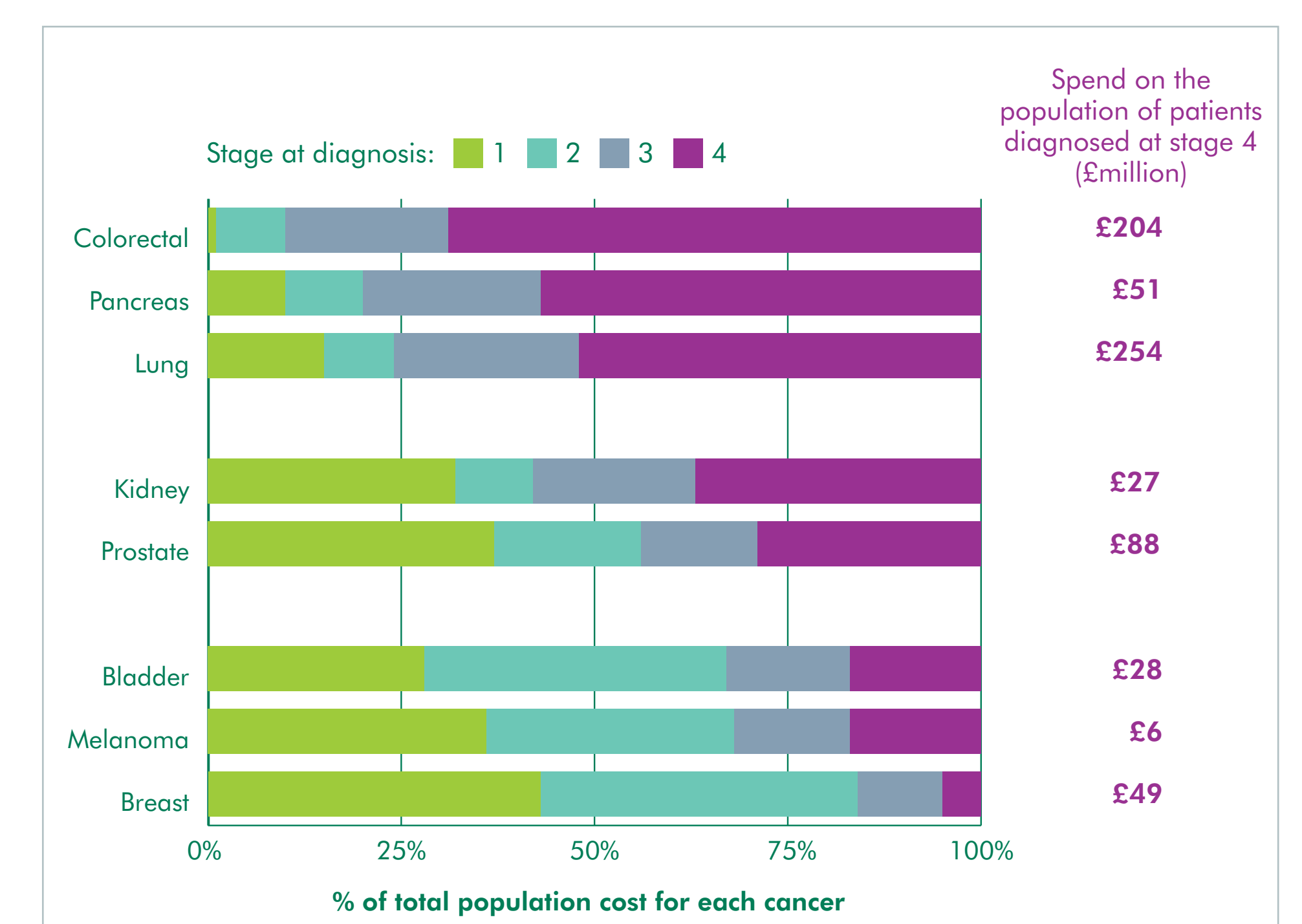**Predicted population costs over 15 years for those diagnosed in 2015 by cancer type and stage at diagnosis**

Figure 2

Estimated costs in 2015 of people living with colorectal cancer in 2015 by stage and cost type
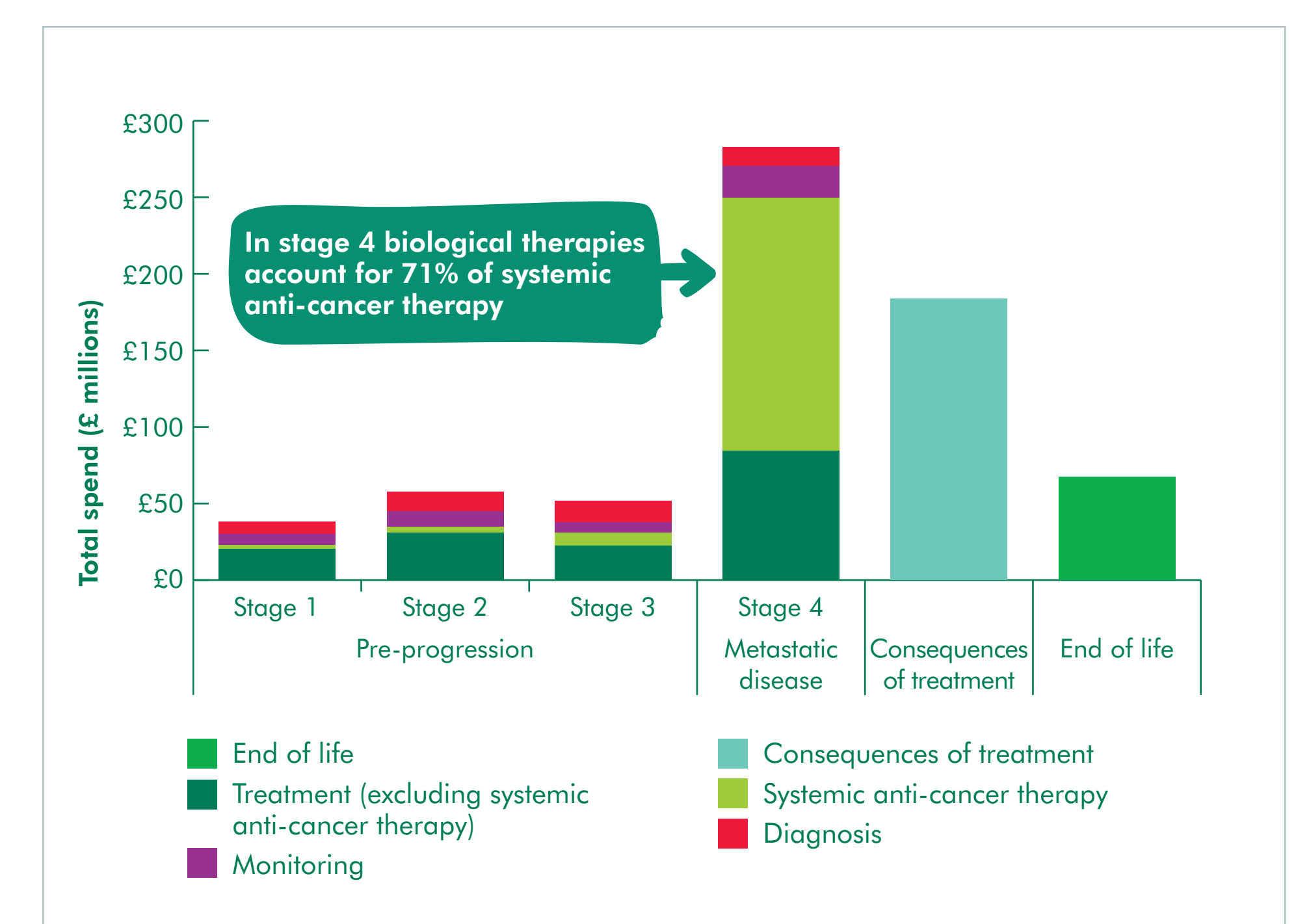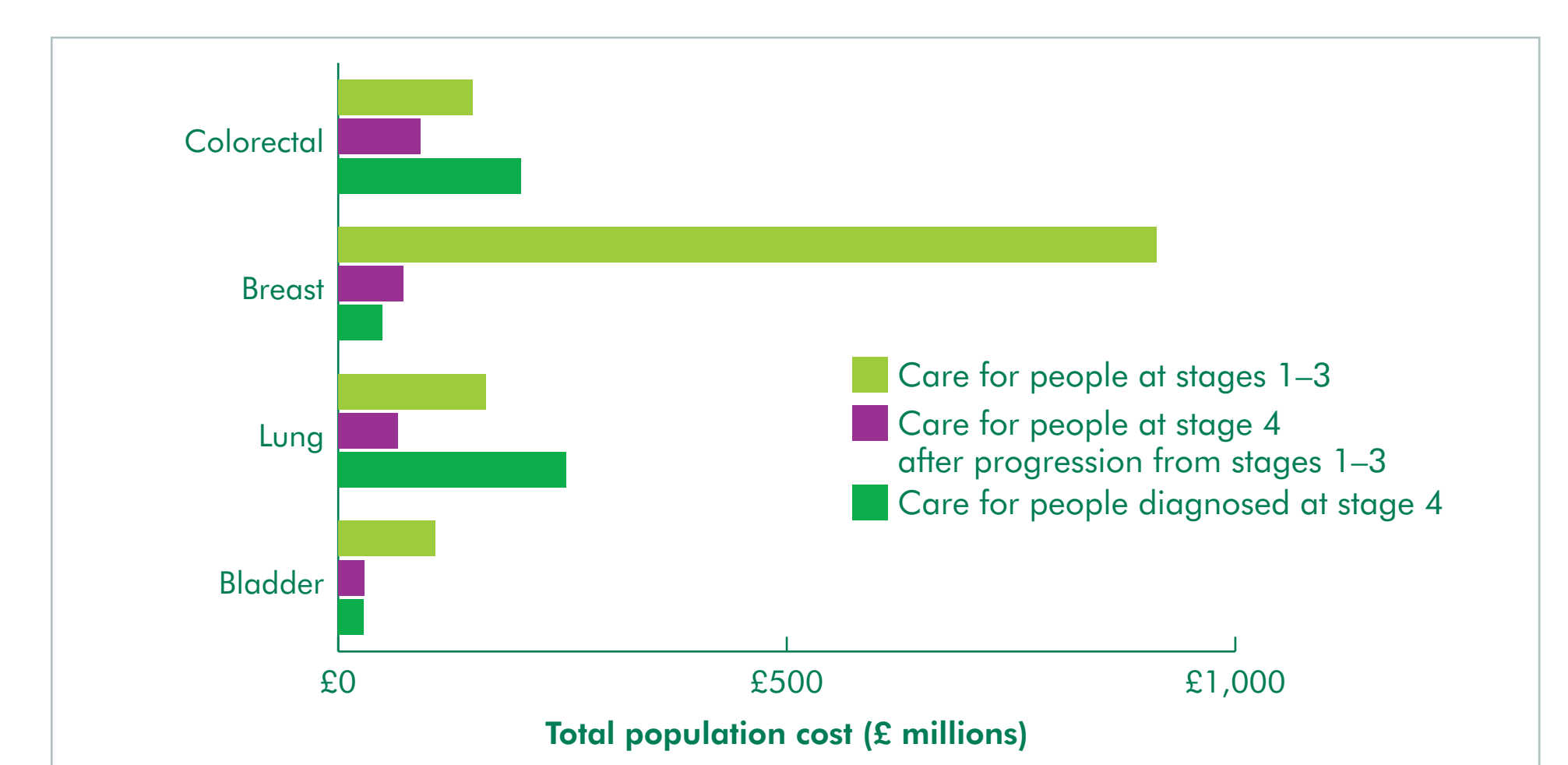

Figure 3

Predicted population costs over 15 years for those diagnosed in 2015 by stage at diagnosis and estimated progression

Conclusions

This model demonstrates the complex relationship between stage, survival and costs. The share of spend on people diagnosed with stage 4 disease varies by cancer type and is particularly high for colorectal, pancreas and lung cancer. We have also seen how population spend on people who develop a metastasis after a period of living with stages 1 to 3 can be significant.

Reference

1. Percentage of those diagnosed with cancer in 2014 with known stage who were diagnosed at stage 4. Public Health England. 2016. Stage breakdown by CCG 2014. www.ncin.org.uk/view?rid=3006

Limitations

This modelling is based on assumptions about semi-optimised pathways so does not capture the full variety of clinical practice. More information and real data is needed to fully appreciate these relationships however the model demonstrates the complexity involved. It highlights that an early stage diagnosis doesn't always lead to cheaper care despite generally being better for the person living with cancer.

The model doesn't include non-cancer conditions that may be indirectly related to the cancer. These incur cost and are believed to impact the cost of the cancer treatment. The model doesn't include wider costs such as social care, personal costs to people living with cancer and societal costs, all of which can be significant.

Acknowledgments

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